

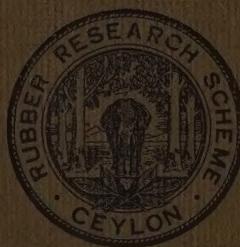
Vol. 10. Part 1.



The  
**Rubber Research Scheme**  
**(Ceylon)**

First Quarterly Circular

for 1933.



April, 1933.



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## FURTHER YIELD RECORDS IN CONNECTION WITH *OIDIUM HEVEAE*

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### FOREWORD

**I**N Rubber Research Scheme *Quarterly Circular* Vol. 8, Part 4, a full account was given of experiments being conducted on Kandanuwara Estate, Matale, to investigate the effect of *Oidium* leaf disease, and of the sulphur dusting method of control, on the yield of severely affected rubber. Yield records kept during 1930 and 1931 showed that in the dusted field, where defoliation was almost entirely prevented in the latter year, the yield was maintained at a normal level, whereas the yield of the control field showed a considerable decline consequent upon the severe uncontrolled *Oidium* attack. The difference in yield of the two fields was most strikingly evident during the months immediately following the wintering period, when the one area possessed a good foliage of healthy young leaves while the other was suffering from severe abnormal defoliation. After comparison of the records with estate figures for yield per acre in previous years it was concluded that the sulphur dusting treatment had been responsible for a nett increase in yield of the order of 200 lb. per acre.

The following report summarises the yield records obtained during 1932.

### DUSTING OPERATIONS

The sulphur dusting during 1932 was almost a complete failure owing to a mechanical breakdown of the machine. The rubber could not be satisfactorily dusted between the 20th January and the 2nd March, a most important period during which most of the trees developed their new foliage. Thus

despite applications of sulphur before and after this period the foliage of the dusted field was very little superior to that of the control. (Owing to the writer's absence on home leave actual figures indicating the comparative degree of defoliation in the two fields are not available). The effect on yield of the return of severe *Oidium* attack to the dusted field can be studied from the figures given below.

#### YIELDS

The method of recording yields in 1932 has been the same as that described for 1930 and 1931 in the publication mentioned above. In brief, yields are recorded every tapping from ten plots in each of the two fields, the number of trees in a plot being 16. The records are thus taken from the equivalent of one tapping task in each field, but this task is divided into ten plots scattered throughout the field. It is assumed that the summation of the yields from these ten plots is representative of the field as a whole.

The monthly yields of the two sets of plots for 1930, 1931 and 1932 are given in Table I, and represented graphically in Graph I. Owing to the monthly variation in the number of tapping days the actual yields from month to month would not be readily comparable. They have accordingly been reduced to a standard figure of 12 tappings per month, so that the figures represent the "yielding ability" during any month rather than the actual yield obtained. This figure for "yielding ability", which is a similar measure to the "yield per tapping" used in recording yields of mother trees and budgrafts, is essential for the study of the relationship between yield and foliage. No allowance has been made for trees out of tapping unless it has been clearly established that the reason for cessation of tapping is entirely extraneous.

GRAPH-I

MONTHLY YIELDS IN LBS RUBBER (160 TREES) PER 12 TAPPINGS

DUSTED PLOTS  
—  
CONTROL PLOTS

LBS. RUBBER

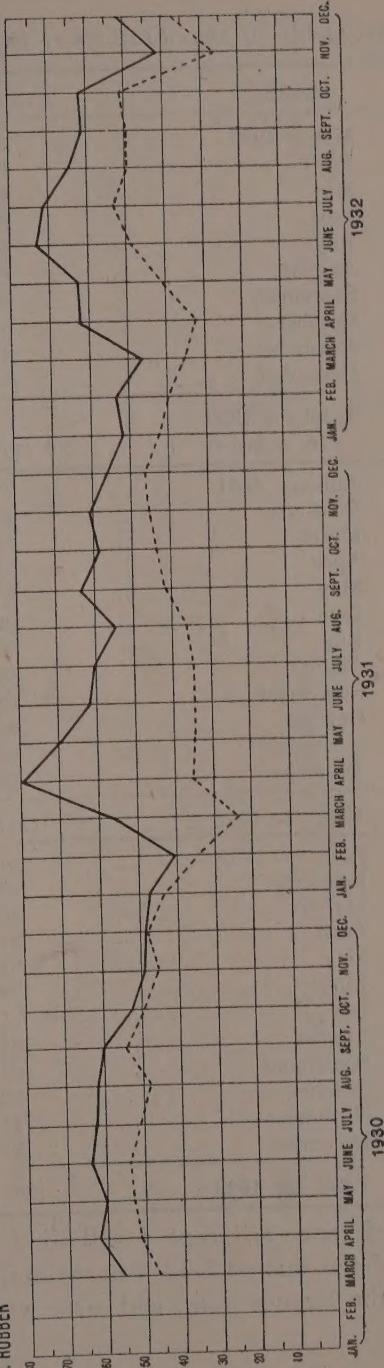


Table I

*Monthly yields of plots (160 trees) in lb. dry rubber per 12 tappings*

Month	Dusted Plots	Control Flots
March 1930	55·3	46·1
April	62·2	51·0
May	60·4	53·0
June	63·9	54·0
July	62·6	51·0
August	62·0	48·2
September	60·3	54·3
October	52·6	49·6
November	49·1	45·7
December	48·7	48·1
Total for 1930 (10 months)	(577·1)	(501·0)
January 1931	47·7	43·9
February	40·8	34·7
March	55·4	23·8
April	79·3	35·4
May	69·3	34·6
June	62·4	34·7
July	60·8	34·6
August	55·4	36·2
September	63·7	41·5
October	59·3	43·9
November	60·8	45·5
December	56·5	46·6
Total for 1931	(711·4)	(455·4)
January 1932	51·7	42·6
February	53·5	39·9
March	46·3	35·3
April	61·9	32·4
May	62·7	40·6
June	73·4	48·5
July	71·8	53·0
August	65·0	49·7
September	61·9	49·4
October	62·2	50·7
November	41·4	26·7
December	51·3	37·6
Total for 1932	(703·1)	(506·4)

Reference to Graph I will show that although the superior yield of the dusted field was maintained to some extent during 1932, the recovery in yield after wintering was slower than in



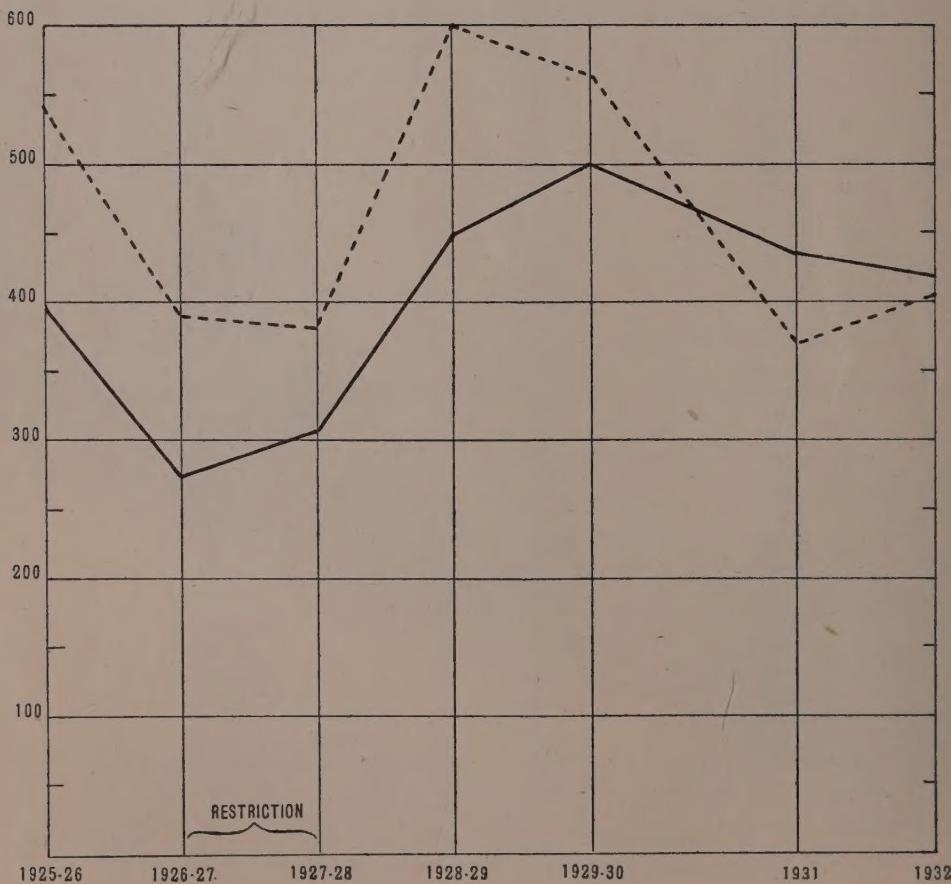
GRAPH-II

ANNUAL YIELDS PER ACRE

— DUSTED FIELD

- - - CONTROL FIELD

LBS PER ACRE



1931 when defoliation was more successfully prevented. The normal depression of yield during the months of January and February was prolonged by a further fall in March when the trees were suffering abnormal defoliation. The yield of the dusted field started to recover in April, and subsequently the monthly yields followed a very similar course in the two areas. In 1932, as in the previous year, there is a striking correlation between yield and condition of the foliage.

Table II gives the actual yields recorded and the average per tree per tapping for the three years 1930-32. The latter figure is the average yield, not of the trees in tapping, but of the total number of trees in the plots. The figure for number of tappings is not the total number of days in the year in which the trees were tapped, but the number on which the yield was recorded. Owing to the fact that the yields are recorded from measurements of latex, the dry rubber content being determined by weekly trial coagulations, no day is included on which rain falls before the latex reaches the factory.

Table II

Year	Total yield in lb.		No. of recorded tappings		Average yield per tree per tapping in ozs.	
	Dusted Plots	Control Plots	Dusted Plots	Control Plots	Dusted Plots	Control Plots
1930 March to December	591	513	123	123	.48	.41
1931	653	408	129	131	.51	.31
1932	560	388	114	111	.49	.35

The fall in yield of the control plots in 1931 has already been commented on. In 1932 the yield per tapping in the control field has increased from .31 oz. to .35 oz., while the similar figure in the dusted field has fallen slightly from .51 oz. to .49 oz. Since the intensity of the disease was as great in 1932 as in previous years it must be concluded that 1932 was a relatively favourable year for crop (as measured in the form of yield per tapping), and that the yield of the dusted field has fallen on account of the failure of the dusting operations.

Table III and Graph II express the same results in terms of yield per acre. The figures previous to 1931 are estate figures relating to the two fields in question, while those for 1931

and 1932 have been calculated from the experimental tappings and the known stand of trees per acre. It will be noted that although the yield of the dusted field has decreased and that of the control field has increased in 1932, the former is still greater than the latter, the reverse of the position in earlier years.

**Table III**  
*Yield per acre in lb. dry rubber*

Year	1925-26	1926-27	1927-28	1928-29	1929-30	1931	1932
Dusted Field	397	272*	305*	449	499†	434	419
Control Field	541	391*	382*	600	564†	368	402

\*Restricted Crop

†10 Months' Tapping.

#### CONCLUSIONS

The yield records obtained in 1931 showed that the control of the disease obtained by sulphur dusting was accompanied by a comparative increase in yield, the biggest difference between the two fields being evidenced during the months in which there was the greatest contrast in the foliage. (See Rubber Research Scheme *Quarterly Circular* Vol. 8, Part 4.) The yields for 1932 offer confirmatory evidence of a negative character. As explained above successful control in the dusted field was not obtained, and this has been reflected in a decreased yield. It is to be noted that the yield of the control field, so far from showing a further decline, has actually recorded a substantial gain in 1932. There is no reason to emphasize this increase as it is probably a normal annual variation, but it lends greater significance to the small decrease in the dusted field. Despite this decrease, however, the yield per acre still remains higher in the dusted field than in the control, a reversal of the position in earlier years before control methods were adopted. The experience of 1932, therefore, indicates that although sulphur dusting cannot be neglected for any one year without detriment to the foliage and to the normal recovery in yield after wintering, the benefits to the general health of the trees conferred by previous years' treatment are to some extent cumulative.

#### ACKNOWLEDGMENTS

The courtesy of the Warriapolla Estates Company, Limited, in permitting these experiments to be continued on their property, and the valuable co-operation of Mr. M. C. Evans, Superintendent of Kandanuwara Estate, are again gratefully acknowledged.

# DISEASES OF RUBBER IN CEYLON, 1932

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## 1. FOREWORD

**T**HIS article is the fourth of a series of annual reviews whose purpose is to keep planters in touch with recent developments regarding diseases and pests of rubber.

During the greater part of 1932 the writer was away from the Island on home leave and therefore had little opportunity of making observations regarding the disease position and the current methods of control. It is considered desirable, however, to maintain the continuity of the series, and an account is given of any diseases of interest which came to the notice of the Research Scheme during the year.

## 2. ROOT AND COLLAR DISEASES

The necessity for making the utmost efforts to control the spread of *Fomes lignosus* even under present economic conditions has been stressed in previous reports. The disease caused by this fungus continues to be the most important on the majority of estates, and it is feared that if adequate control measures are not maintained it may in some instances assume such a serious aspect as to become a limiting factor in the yield of the estate.

There are indications that the presence of *Fomes lignosus* may also give rise to serious problems in replanting old areas. It would seem that in certain instances the fungus is lying dormant in the soil and that the culture, previously staled, becomes re-invigorated when replanting operations are undertaken. The question of removal from the soil of the old rubber roots and stumps offers an important line of investigation in connection with the parasitism of the fungus under various conditions.

Attack by *Ustulina zonata* on root, collar and stem is also important in wet districts and treatment should receive careful attention. Detection of fructifications in the early stages is the first necessity in the control of collar and stem infection, and this can only be done by periodical inspection.

### **3. STEM DISEASES**

There are no new developments to report for 1932 in connection with stem diseases of mature trees.

On some estates which curtailed the usual preventive treatment on economic grounds, Bark Rot was relatively severe in the wet weather in the latter half of the year. In continuous wet weather it is usually impossible to make regular applications of greasy waterproof mixtures, and under such circumstances resource must be had to water-miscible disinfectants.

Brown Bast remains a serious factor in reducing yields in certain dry districts, but under present economic conditions treatment is not being carried out extensively.

### **4. LEAF DISEASES**

It is satisfactory to note that despite the cessation of manuring and other cultivation measures defoliation due to *Phytophthora palmivora* was very slight. This was possibly due to the abnormal distribution of monsoon rains, for although the rainfall during the last five months of the year was unusually severe, June and July were exceptionally dry months.

As in former years *Oidium* caused defoliation of late wintering trees in most districts. The disease continues to be very severe at mid-country elevations where the fungus is favoured by relatively cool and dry atmospheric conditions, but in the main low-country districts it seems unlikely to assume a serious aspect. It is not impossible, however, that continued partial defoliation of a proportion of trees may ultimately lead to a decline in yield.

### **5. DISEASES IN BUDDED CLEARINGS**

Two diseases of young budgrafts were investigated in the early part of the year.

(1) This was a die-back of young green shoots from the union and was observed on two estates in the Kalutara district and at the Experiment Station, Nivitigalakele, the age of the shoots being 1-6 months. In all the specimens examined *Diplodia* was present and was apparently responsible for the die-back up the shoots, entrance having been gained at or near the union. In some cases the tip of the shoot was also withered. The fungus was isolated in pure culture and inoculations made on wounded and unwounded green bud-shoots. From the fact that no infection occurred it was concluded that *Diplodia* was only secondarily responsible for the diseased condition, and it was necessary to determine the primary factor.

A careful study was made of all stages of the disease in the field. A longitudinal section at the union of affected plants showed in all cases an internal pad of coagulated latex at the junction of the shoot with the stock. It was concluded that this pad was caused by an internal fissure, a phenomenon which has been described in Java by Bobilioff. In all cases the shoot bore a very heavy head of foliage, and it seemed probable that excessive movement of the shoot in the wind, in conjunction with the internal fissure, caused a rupture at the union through which *Diplodia* gained entrance. The origin of these fissures is not known, but they are possibly connected with very rapid growth, and appear to occur more commonly in certain clones. It is significant that in all the specimens examined the stock was exceptionally large (3-5 years old), resulting in a very rapid growth of the bud-shoot. It is possible that under such circumstances unsatisfactory unions may be somewhat frequent. It would appear that Clone B. D. 5 is particularly liable to the trouble, and it is also interesting to note that all the diseased shoots at Nivitigalakele were of one (Ceylon) clone. It is suggested that with buddings of apparently susceptible clones on very large stocks, one stock shoot should for some weeks be allowed to grow in addition to the bud-shoot so as to retard the early rate of growth of the latter.

(2) After the exceptional drought experienced in January and February a number of specimens was received in which the bark of 2-3 year-old buddings had died back near the union. A study of the disease on an estate in the Ratnapura district showed that the primary cause was sun-scorch, which had caused cracking of the bark on the raised portion of the "elephant foot". In most cases *Diplodia* had gained entrance through the cracked bark with consequent extension up the stem and into the wood. The old bud-shoots had shown no effects in the foliage as the result of this disease condition, but young green shoots were reported to have died back. There was no evidence of the fungus invasion having started from the stock snag, and in some instances the diseased portion was entirely separate from the snag. The plants could mostly be treated by excision of the diseased tissues.

Trouble is being commonly experienced with decay of the stock snag before callusing is completed, the rot often extending several inches down into the stock or up the scion. Where decay has occurred all rotted wood should be cleaned out with

a chisel, the surface painted with disinfectant, and the resulting cavity filled with a plastic mixture such as \*Colas and sand in the proportions 1:2. Prevention, however, is better than cure, and it should be the aim of those possessing young budded clearings to prevent the occurrence of this decay by ensuring rapid callus growth and protecting the snag with a satisfactory waterproof mixture. An application of manure prior to the final cutting of the stock is the best insurance against this trouble, but a great deal can also be done by correct treatment of the stock on the following lines:

The stock should be finally cut back to the point of union when the shoot is growing vigorously and has formed about 3 ft. of brown wood; the time of "desnagging" must not be delayed until the stock is already dead and discoloured at the point at which it is to be cut. A common mistake is to make the cut too flat; it should be made at an angle of at least 45°, this being particularly important with large stocks. The ideal material for applying to the cut stock has not yet been discovered, but satisfactory results are being obtained at the Rubber Research Scheme Experiment Station by painting with a 10% mixture in water of Brunolinum Plantarium, and applying a coating of Skene's pruning mixture on the following day. The snags should be periodically inspected until the callusing is complete, and the waterproof covering renewed if necessary. For a fuller account of the treatment of snags reference may be made to Rubber Research Scheme *Quarterly Circular*, Vol. 9, Parts 3 and 4.

It is of interest to record that a specimen was received of the tap root of a young rubber stump attacked by *Sclerotium Rolfsii*. This fungus, which has a very wide host range, has hitherto only been reported on the hypocotyl of germinating seeds, and on renewing bark.

#### 6. DISEASES AND PESTS IN NURSERIES

Die-back of green shoots caused by *Phytophthora palmivora* has again been in evidence in budwood nurseries during wet weather. The statement in former reports that Clone B.D. 5 is particularly susceptible to this disease is confirmed by experience in 1932. Satisfactory control of the disease can be obtained by spraying with Bordeaux Mixture or a similar copper fungicide.

Other diseases and pests in nurseries do not call for special comment.

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\* During the recent hot weather the Colas-sand filling has been found to accentuate damage due to sun-scorch of the callus bark. A note on this injury will be published in the next *Quarterly Circular*.—R. K. S. M., May, 1933.

# THE EFFECT OF EARTH-COWDUNG MIXTURES ON RENEWING BARK

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## 1. INTRODUCTION

THE practice of applying mixtures containing cow-dung and earth as basic substances to recently tapped bark at the time of the annual or six-monthly change-over of the tapping panel has been widely adopted in Ceylon for many years. The claim by the advocates of this practice that the bark renewal is thereby benefited does not, however, appear to have been substantiated by any controlled experiments. An offer by Mr. A. D. Panton, Superintendent of Nivitigala Estate, Nivitigala, to co-operate in an experiment to shed light on this point was therefore readily accepted.

## 2. DETAILS OF EXPERIMENT

(a) *Experimental Area.*—A uniform field of well-grown mature rubber (1905 planting) was selected on Nivitigala Estate. Tapping had been stopped on the 31st May, 1931, for an indefinite period.

(b) *Treatments.*—Three mixtures were chosen which were thought to be representative of the types used on Ceylon estates. The composition of these mixtures is given below:

Treatment	A	B	C	D
Ant-hill earth	24 parts	14 parts	16 parts	
Cow-dung (dry)	12 "	28 "	32 "	
Tallow	6 "	7 "	—	
Sulphur	3 "	—	—	
Copper Sulphate	1 "	—	—	
Lime	1 "	—	—	
				CONTROL

Mixture A was prepared as follows: The ant-hill earth and dried cow-dung were thoroughly mixed and the sulphur added. The tallow was then melted and stirred in. The copper sulphate and lime were dissolved in enough water to make a thick paste of the whole mixture. Mixture B was prepared by mixing the earth and cow-dung, adding water to make a paste, and then working in the unmelted tallow which was broken down with the hands. The method of incorporating the tallow used for Mixture A was found to be the quicker, and probably ensures a more intimate mixture.

(c) *Arrangement of Plots.*—Each plot consisted of approximately 60 trees ( $10 \times 6$ ). Fourfold replication of each treatment (including the control) was adopted, giving a total of 16 plots. The plots were arranged in the form of a Latin Square as shown below. The special feature of a Latin Square is that each treatment occurs once in each column and once in each row, thereby allowing for elimination of soil differences by statistical methods in two directions, i.e., between columns and between rows.

A	B	C	D
C	D	A	B
B	C	D	A
D	A	B	C

In order to facilitate the identification of plots by the labourers applying the mixtures, the outside trees of each plot were painted with a broad ring, a colour being allotted to each treatment.

(d) *Application.*—Tapping was stopped on the 31st May 1931, but owing to incessant rain it was impossible to apply the mixtures until August. The applications were made on August 9th to 11th, under the personal supervision of the Superintendent. A heavy fall of rain following immediately afterwards necessitated a second application being made.

As noted below all mixtures were found to adhere satisfactorily.

### 3. RESULTS

The trees were examined by the junior author on the 15th to 17th August, 1932, i.e., one year after the mixtures were applied. A sample of renewing bark was taken from each tree one inch above the middle of the cut, and the thickness of each sample measured with a micrometer gauge to 1/100 millimetre. The mean thickness of renewing bark for the four treatments was as follows:

Treatment	A	B	C	D
Mean Thickness of Renewing Bark in mms.	3.52	3.48	3.34	3.44
Number of trees	205	200	216	187

A statistical examination of the detailed results shows that there is no significant difference between any of the treatments.

While taking the bark samples the outer corky layer together with the layer of cow-dung mixture became detached in most cases, and the above figures are therefore measurements of the live cortex only. In order to determine whether the application of the mixtures had resulted in any increased thickness of the outer layer all samples which retained this layer intact were measured with and without the outer bark. The mean figures for the difference i.e., the thickness of the outer bark only, are given below:

Treatment	A	B	C	D
Mean Thickness of Outer Bark in mms.	1.13	1.21	1.13	1.01
Number of trees	74	92	88	75

It will be seen that the figures for the treated bark are in all cases slightly higher than that for the control, but it is probable that most if not all of this difference (amounting to only about  $\frac{1}{5}$ — $\frac{1}{10}$  millimetre) was due to the thickness of the actual layer of mixture. In any case measurements of rough bark to this degree of accuracy are rather uncertain, and it must be concluded that no increased thickness due to the treatments is evident.

The adherence of all three mixtures was satisfactory, Mixtures A and B, containing tallow, being somewhat better in this respect than the mixture of earth and cow-dung alone. In the B and C plots a large number of panels had been stripped of the mixtures by termites, but Mixture A, containing various chemicals, was untouched.

#### 4. CONCLUSIONS

This experiment shows that under the conditions obtaining on Nivitigala Estate during the period August, 1931, to August, 1932, the application of the mixtures concerned has not proved beneficial to the renewal of the recently tapped cortex, and this conclusion can probably be extended to embrace any other mixtures of a similar type. It would be rash, however, to conclude that under no circumstances will the application of such a mixture be of benefit. Any improvement in bark renewal as the result of such treatment would probably be due to partial shading of the inner cortex from strong sunlight. It is to be noted that unusually wet weather was experienced on Nivitigala Estate for some months after the applications were made, so that the renewing bark was seldom exposed to sunlight. It is possible that the treatment may be of benefit when carried out immediately before the wintering period or on estates where the foliage is sparse. Further experiments are needed to elucidate this point, but in the meantime it would appear that estates with normal foliage which employ a six-monthly change-over might omit the treatment when the cuts are changed in September.

#### 5. ACKNOWLEDGMENT

Grateful acknowledgment is made to the Grand Central Rubber Estates, Ltd., for their permission to carry out this experiment, and to Mr. A. D. Panton, Superintendent of Nivitigala Estate, for his co-operation.

## THE RUBBER RESEARCH SCHEME (CEYLON)

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Minutes of the twelfth meeting of the Board of Management, held at 11 a.m. on Thursday, February 16, 1933, in Room No. 202, New Secretariat, Colombo.

*Present.*—Dr. W. Youngman (in the chair), Messrs. C. W. Bickmore, C.C.S., (Actg. Financial Secretary), I. L. Cameron, C. E. A. Dias, J.P., B. F. De Silva, H. R. Freeman, M.S.C., C. A. Pereira, B. M. Selwyn, E. W. Whitelaw, and Colonel T. Y. Wright.

Mr. T. E. H. O'Brien, Director of Research, was present by invitation and acted as Secretary to the meeting.

Apology for absence was received from Mr. G. K. Stewart, M.S.C.

The Chairman welcomed to the Board Mr. E. W. Whitelaw who had been nominated by the Rubber Growers' Association in place of Mr. J. D. Hoare. He also reported that Colonel G. B. Stevens had been nominated by the Planters' Association to act for Mr. F. H. Griffith during his absence from the Island. Mr. Griffith had now returned and resumed duties.

The Chairman reported that the following decisions had been reached, by circulation of papers since last meeting :

(a) *Budding Experiment.*—Decided that the Scheme should confine its attention, for the present, to experiments on its own property.

(b) *Test tapping of new clones.*—Decided to arrange co-operation with estates in test tapping new clones on the lines proposed by the Director of Research.

(c) *Tapping Questionnaire.*—Decided to issue a questionnaire to estates which receive the publications of the Scheme, in order to obtain information regarding the results of new tapping systems.

(d) *Amendments to Provident Fund Rules.*—Decided to accept the amendments proposed by the Deputy Financial Secretary and to adopt the rules of the Fund as amended.

### STAFF

The Chairman reported that Mr. Murray had returned from home leave on January 2nd and resumed duties.

A vote of thanks was passed to Mr. M. Park, Government Mycologist, for services to the Scheme during Mr. Murray's absence, and to the Director, Rothamsted Experimental Station for providing facilities for Mr. Murray's course of study leave at that Institution.

## ACCOUNTS

*Receipts and Payments.*—Statement of receipts and payments of the Board for the quarter ended December 31, 1932, was adopted. Statements of expenditure on the Experiment Station for October, November and December, 1932, were tabled.

*Night Watchman for Laboratories.*—It was decided to appoint a night watchman in view of a minor burglary having occurred at the laboratories.

## DEVELOPMENT OF THE RESEARCH SCHEME

The Chairman read extracts from a letter from the Chairman, Rubber Growers' Association drawing attention to the need for research on latex and raw rubber with a view to increasing consumption and suggesting that application should be made for a grant from the Rubber Restriction Fund to provide extra staff for the purpose. After discussion the Board agreed in principle to the need for strengthening the chemical staff of the Scheme and decided to consider the matter later in connection with proposals to acquire an estate.

A letter from the Hon'ble the Minister for Agriculture and Lands in reply to a resolution passed at the last meeting of the Board, was read. The letter indicated that any application for a grant from the restriction fund would be considered on its merits.

A report from the Director of Research on alternative estates which might be suitable for experimental purposes, was considered. The Chairman said there were 3 estates mentioned which might be suitable. It was decided to appoint a Committee consisting of Messrs I. L. Cameron, C. E. A. Dias, F. H. Griffith, B. M. Selwyn and E. W. Whitelaw to visit the estates and report to the Board at a meeting to be held next month.

*Visits to estates for advisory and experimental purposes.*—With a view to safeguarding the Scheme against possible claims for damages in connection with advisory and experimental work on estates it was decided to adopt a simple form of indemnification to be signed by the Proprietor or Agent of an estate before a visit to the estate for advisory or experimental purposes is undertaken.

## REPORTS

Technical officers' reports for the period June to December, 1932, were considered and adopted.

The following reports were tabled:—

“Alternative forms of raw rubber”.

“Notes on the after-treatment of budded stocks”.

“The effect of earth-cowdung mixtures on renewing bark”.

## LONDON ADVISORY COMMITTEE

Consideration of the minutes of meetings held on October 28, 1932, was deferred until next meeting.

The following report was tabled:—

“Crepe from coagulum heated with hot water”.

# RUBBER RESEARCH SCHEME (CEYLON)

## LIST OF PUBLICATIONS FOR SALE.

*Bulletins at Rs. 1-00 per copy.*

- No. 1. The Effect of Tapping on the Movements of Plant-Food in *Hevea brasiliensis*.
- No. 2. The Effect of Tapping on the Movements of Plant-Food in *Hevea brasiliensis*.
- No. 3. Seasonal Variations in the Movements of Plant-Food in *Hevea brasiliensis* Part I.
- No. 4. The Physiological Effects of Various Tapping Systems, Part I.
- No. 5. Progress Report on Vulcanization Tests
- No. 6. The Physiological Effects of Various Tapping Systems, Part II.
- No. 7. Do. Do. Part III
- No. 8. Seasonal Variations in the Movements of Plant-Food in *Hevea brasiliensis*, Part II.
- No. 9. Vulcanization Tests.
- No. 10. Do.
- No. 11. Variability in Rubber Manufacture.
- No. 12. Progress Report of the Rubber Research Chemist.
- No. 13. Vulcanization Tests.
- No. 14. On the Variation in the Number of Latex Vessels present in *Hevea brasiliensis*.
- No. 15. Vulcanization Tests.
- No. 16. On the Natural Clotting of Rubber Latex.
- No. 17. Vulcanization Tests.
- No. 18. Measurements of "Bark Renewal."
- No. 19. Vulcanization Tests.
- No. 20. Do.
- No. 21. Do.
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